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ABSTRACT

Standards established by Maryland public schools for information and communication distribution systems in new construction and renovation projects are detailed. The function of the communications distribution room (CDR) is to house the distribution equipment of the school's communications systems and may contain gateways, tuners, video cassette recorders, audio/video distribution systems, mainframes, documentation, and test equipment. It is connected to a communications closets (CC) for horizontal distribution to the end user. The CDR is the demarcation point for external systems such as telephone and cable lines. Primary considerations for CDR development are presented. In retrofitted facilities where a CDR cannot be provided, a CC can perform the termination and cable distribution function of the CDR. The CC distributes communications cable to end users or to communications distributions outlets to user areas. Development requirements for the CC are detailed. Horizontal distribution is described as the means by which information and communications services are brought from the CC to the user station or the communications outlet. Cable and wiring specifications for this transfer are discussed. Communications outlet requirements for the classroom and the laboratory are presented, along with electrical system requirements. The Maryland Public School Minimum Technology Capability Statements in New Construction and Renovation Projects is included and details the building information and communications distribution system and other aspects of building design for Maryland public schools. (RE)

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Standards for
Information and Communications Distribution Systems
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COMMUNICATIONS DISTRIBUTION ROOM (CDR)

A Communications Distribution Room (CDR) is recommended for every building. It houses the distribution equipment of the school's communications systems and is connected via cabling to Communications Closets (CCs) for horizontal distribution to the end user. The CDR might additionally house gateways, tuners, video cassette recorders, audio and video distribution systems, mainframes, etc. System documentation and test equipment may be contained in the CDR. CDRs may also double as a CC and feed workstations within 90 meters.

The CDR functions as the demarcation point for external systems such as telephone company lines, cable television system connections and fiber optic cables, and contains punchdown blocks or the terminators for these systems. In retrofitted facilities, flexibility exists for the specific equipment stored in the CDR. However, the CDR may even house file servers or mini-computers for the data systems. The CDR may be the point where servers are connected to facility cabling. The CDR could additionally act as the source for delivery of communications to other buildings.

If a CDR cannot be provided, especially in retrofitted facilities, a CC can perform the termination and cable distribution function of the CDR. In this case, the CC functions as the origination node for the horizontal distribution system and houses the distribution equipment.

Primary considerations for CDR development include environmental conditioning, power, security, and access by operational and maintenance personnel. The following must also be taken into consideration:

- The CDR must be uncluttered and contain adequate provisions for the equipment and documentation that cannot be housed in the CCs.

- Lighting requirements of 50-70 footcandles measured three feet above the finished floor are recommended.

- An environmentally controlled atmosphere is required. The ambient room temperature in the CDR must be maintained between 50 and 85 degrees F. Relative humidity should not exceed 70 percent. Any required cooling must accommodate an internal 50 watt per square foot heat load generated within the CDR, if the CDR contains active equipment.

- An adequate and uninterruptable power supply is needed for the CDR. As a minimum a quadruplex receptacle should be installed on each of the three walls (excluding the door wall) to power the CDR equipment and test equipment. All receptacles must be quadruplex, isolated ground receptacles and must be wired (line, neutral, common ground) to the power distribution panel. Each of the quadruplex receptacles must be on its own 20 ampere circuit breaker from the primary power source.

- Because computer networks and other technology equipment may provide ground paths over which electrical noise and spikes may be transmitted and interfere with the operation of the equipment, it is important to provide an isolated ground for the CDR. A review of the facility's entire electrical grounding situation can be conducted with an electrical engineer.

- Surge protection is required in the CDR and CC. No transformers should be in this area.

- Non-conductive fire suppression and smoke evacuation systems are required as per BOCA Code. If local code requirements are more stringent, then they must be complied with. Electronic microprocessor-based fire/life safety systems may be considered.

- The location of the CDR must avoid proximity to water pipes, or a location below lavatory facilities. No plumbing activities should occur in the area of the CDR.

- The CDR should be accessible from a corridor.

- A security system should be considered for the CDR. Detection systems and electronic microprocessor-based security systems are two choices for security control.

- All cabling and distribution equipment in the CDR must be permanently labeled, identifying the origination point. System documentation and detailed cable drawings representing the CDR are to be provided.

- The size of the CDR may vary depending on the quantity and types of communications to be delivered to the user area. Square footage can vary between 150 and 300. CDR size requirements should allow space for future expansion.

- The CDR should have a telephone jack.

The Electronic Industries Association/Telecommunication Industries Association (EIA/TIA) 569 Standard provides requirements for CDRs and CCs.

COMMUNICATIONS CLOSETS (CC)

Communications Closets (CCs) act as the distribution point for communications cable either to the end user or the communications outlets in user areas. The wiring distribution system will support cabling from the Communications Distribution Room to the CC. The CCs are centrally located near user areas and are connected to user areas via cable runs of no more than 90 meters. The number of CCs is a function of the number and distance of user areas.

The Communications Closets house cable intermediate distribution frames and termination equipment used to provide signal distribution to the Communication Outlets and routing equipment. The CCs must not be located near water pipes or below lavatory facilities and should be accessible from a corridor. The CCs must not serve as a custodial or storage room. Convenient access will be provided in the CC for performing system administration and maintenance.

Communications Closets have the same air temperature and relative humidity requirements as the CDR. A telephone jack should be provided.

A Communications Closet may serve the function of a CDR if source equipment is limited and can be accommodated in the CC. If a CC does not exist on the floor where facility wiring is installed, one may be constructed in a room that is serving another primary function such as a user area.

Empty conduit should be provided for connections between Communications Closets and the CDR and have a 200 lb pull line.

HORIZONTAL DISTRIBUTION

Horizontal Distribution is the means by which information and communications services are brought from the Communications Closet to the user station location or the Communications Outlet.

Cables for data will conform to the EIA/TIA-568A standards for category 5 cable. Specifications should require that installed cable be tested to verify category 5 capability in accordance with the EIA/TIA-TSB-67 standard. Cable for telephone will conform to the EIA/TIA 568A standards for category 3 cable.

The recommended distribution of the wiring system for the backbone network is a ceiling raceway. However, for retrofitted facilities, other wiring alternatives do exist such as underfloor. Hung cable trays should be installed above the ceiling with good access: minimum of 18 inches on one side and a minimum of 10 inches above tray.

Runs from the outlet to the Communications Closet shall be no greater than 90 meters.

COMMUNICATIONS OUTLETS

Generic classroom: A minimum of three jacks for computers; one computer jack for the teacher work station; a minimum of one jack for video; and one jack for telephone.

Laboratories (e.g. Science, Technology Education, Family/Consumer Science): A minimum of one computer jack for every work station (but not less than one computer jack for every four students); one computer jack for the teacher work station; a minimum of one jack for video; and one jack for telephone.

ELECTRICAL SYSTEM

Provide a minimum of one 20A, 125V, 1 Phase isolated ground type duplex receptacle for computer service in each classroom. A maximum for four isolated ground type receptacles should be connected to each 20A, 120V, 1 Phase branch circuit breaker. Provide a neutral wire for each 20A, 120V, 1 Phase branch circuit breaker that serve computer equipment.

The neutral size of cable for a panel serving computer load is an important consideration. Sizing the neutral current for double the capacity of the phase conductor is a good rule of thumb.

Computer equipment creates a non-linear load into the Electrical Power System. Therefore, the ANSI (American National Standards Institute) C 57.110 Standard, IEEE (Institute of Electrical Electronics Engineers), presently states that the size of transformer (KVA) serving computer equipment must be greater than the power requirement for a linear load. Manufacturers have developed a type "K" factor transformer for non-linear loads and should be used for computer loads.

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Maryland Public School
Minimum Technology Capability Statements
in
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1. High Capacity (i.e., full graphics, sound and video) INTERNET access from classrooms/instructional areas.

2 Library/Media Center information resources (e.g., CD's, databases) accessible from classrooms/instructional areas.

3. Library/Media Center or other school-based information resources accessible from home or another school.

4 Automated cataloging and circulation system in Library/Media Center and accessible from classrooms/instructional areas.

5. Communication via E-mail within the school building and with locations outside the school.

6. Instructional and administrative software on a central file server accessible from classrooms/instructional areas and administrative support areas.

7. Through the use of technology, access to school/student data (ex: attendance, grades) from classrooms/instructional areas and administrative support areas.

8. Telephone access from indoor and outdoor classrooms/instructional areas and administrative support areas.

9. Voice and video teleconferencing with locations outside the school.

10. Facility in the building designed and equipped for producing various multi-media presentations.

11. An interactive distance learning classroom (i.e., a classroom specifically designed for two-way transmission of voice and video from one school to another for instructional proposes).

12. Voice messaging (for homework information, bulletins, voice mail, etc.).

13. Network Management (e.g., on-line trouble shooting for networks or workstations) from locations outside the building (e.g., the central office).

14. Access from classrooms/instructional areas to a variety of video (e.g., videotapes, laser discs, cable, satellite, microwave) from a centralized distribution point in the building.

15. Fax technology available from classrooms/instructional areas and administrative support areas.

16. A public address system with access to all classrooms/instructional areas and administrative support areas.

* These statements refer primarily to the building information and communications distribution system and other aspects of building design (e.g. lighting, acoustics) whether or not the full complement of equipment can be purchased initially for the user areas.

March 1996